Nikkalite®

Retroreflective Products PB NO.7100/8100

Nikkalite® BRAND ENGINEERING GRADE(EG) 7100 AND 8100 SERIES



NIPPON CARBIDE INDUSTRIES CO.,INC.

1. INTRODUCTION

Nikkalite® Brand Engineering Grade(EG) retroreflective sheeting is a beaded plastic material that renders high retroreflectivity at night. It is designed for use mainly on traffic signs and is highly resistant against the extremes of hot, cold, dry, and humid weathering conditions. Traffic signs faced with Nikkalite® Brand sheeting and transparent process colors are attractive in appearance and highly visible during both day and night, and contribute greatly to driving safety. This sheeting is available in seven standard colors with two types of precoated adhesives: Heat-activated (HA) or Pressure-sensitive (PS).

2. TYPES OF ADHESIVES

The Nikkalite® 7100 and 8100 Series are, coated on their backs with different types of adhesives and require different application methods.

A. The 7100 Series sheeting is pre-coated with HA adhesive and must be applied to the substrates with a vacuum-heat applicator. Immediately after application and cooling, the 7100 Series sheeting becomes permanently bonded to the substrate. Since the adhesive is not tacky, the sheeting can be repositioned easily before final bonding.

B. The 8100 Series sheeting is pre-coated with PS adhesive that will bond the sheeting to the substrate with the application of pressure only. The pressure can be applied with a hand-roller, a squeegee, or a roller-applicator. Permanent bonding will take place approximately 48 hours after application. DO NOT ALLOW THE ADHESIVE TO FREEZE DURING THE 48-HOUR CURING PERIOD.

3. COLORS

Nikkalite® EG sheeting is available in the standard colors as listed on the Table 1 below and conforms with practically all specifications of traffic control signs and devices throughout the world.

Table 1

Color	Heat Activated	Pressure Sensitive
White	7112	8112
Yellow	7104	8104
Red	7105 & 7135	8105 & 8135
Blue	7106	8106
Orange	7107/7177	8107/8177
Green	7108	8108
Brown	7109	8109

4. RETROREFLECTIVE INTENSITY

Nikkalite® Brand EG sheeting is designed and manufactured to render high head-on and wide-angle retroreflectivity.

A. Retroreflectivity of the various colors of EG sheeting meets most retroreflective sheeting standards world-wide, such as ASTM D 4956(U.S.A.),EN12899-1(European Standard), JIS Z 9117(Japan), etc.

B. Typical coefficient of retroreflection of EG sheeting.

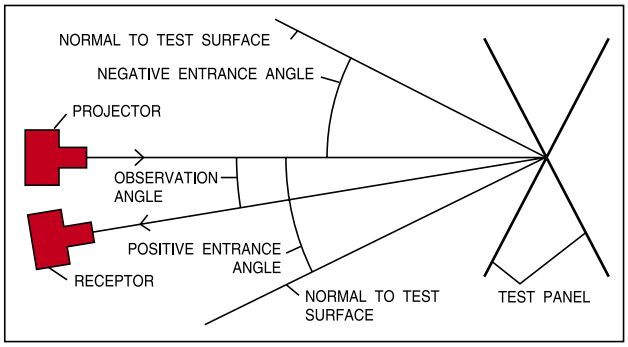
Typical coefficient of retroreflection of each color, when measured with methods specified in the various country standards of retroreflective sheeting and expressed in candelas per lux per square meter, appears in Table 2 below. The figures in the brackets show the highest minimum retroreflectivities among all the standards we collected from the countries world-wide.

Table 2 Typical Coefficient of Retroreflection (cd/lux/m²)

O.A.	E.A.	White	Yellow	Red	Blue	Orange	Green	Brown
12'(0.2°)	-4°/5°	108 (80)	70 (50)	21 (14.5)	8.2 (5.0)	54 (25.0)	28 (9.0)	5.4 (1.0)
	15°	90 (55)	64 (35)	19 (10.0)	7.2 (3.0)	48(–)	26 (3.0)	5.0(–)
	30°	57 (34)	48 (22)	13 (6.0)	5.0 (2.0)	35 (7.0)	18 (3.5)	3.0 (0.3)
	40°	30 (11)	30 (7)	8 (2.0)	2.4 (1.0)	20 (2.0)	10 (1.5)	1.4 (0.1)
20'(0.33°)	-4°/5°	83 (50)	53 (35)	16 (10.0)	6.4 (3.0)	41 (15.0)	21 (7.0)	4.2 (0.7)
	15°	80 (45)	50 (20)	15 (8.0)	6.0 (2.0)	36(–)	20 (3.0)	3.9(–)
	30°	47 (29)	40 (16)	11 (4.0)	4.2 (1.0)	29 (8.5)	15 (3.0)	2.7 (0.5)
	40°	26 (11)	26 (6)	7 (2.5)	2.0 (0.8)	16 (2.0)	9.4 (1.2)	1.2(–)
0.5°	-4°/5°	44 (30)	33 (25)	11 (7.5)	3.8 (2.0)	26 (13.0)	13 (4.5)	1.3 (0.3)
	30°	34 (15)	29 (13)	8.7 (3.0)	3.1 (0.8)	21 (4.9)	11 (2.2)	1.0 (0.2)
1.0°	-4°/5°	20 (5.0)	16 (3.0)	5.0 (1.5)	1.8 (0.6)	11 (–)	5.3 (1.0)	1.1(–)
	15°	19 (3.0)	15 (2.0)	4.8 (1.0)	1.7 (0.3)	9.2(–)	5.0 (1.0)	1.0(–)
	40°	11 (1.5)	9.5 (0.5)	2.8 (0.3)	1.1 (0.1)	6.2(–)	3.2 (0.2)	0.8(–)
2.0°	-4°/5°	6.2 (5.0)	6.0 (3.0)	2.1 (0.8)	0.6 (0.2)	4.2 (1.5)	1.9 (0.6)	0.6(–)
	30°	5.4 (2.5)	4.7 (1.5)	1.5 (0.4)	0.5 (0.1)	3.2 (0.8)	1.6 (0.3)	0.5(–)
	40°	4.2 (1.5)	3.8 (1.0)	1.2 (0.3)	0.4 (0.06)	2.7 (0.7)	1.2 (0.2)	0.4(–)

Note: O.A = Observation Angle and E.A. = Entrance Angle See Figure 1, below.

Figure 1



5. TECHNICAL DATA

A. Physical Properties of Nikkalite® EG Sheeting

Table 3

Property	Test Method	Results
Average Thickness	Micrometer	0.175mm
Average Gloss	Glossmeter 85°	96
Tensile Strength	Instron at 30cm (12")/minute	5.0kg (11lb)
Elongation	Instron at 30cm (12")/minute	24%

B. Physical Properties When Bonded to Aluminum Panels

The data below are based on tests conducted on EG sheeting applied to acid-etched aluminum panels and conditioned for 48 hours or more at a room temperature of 23°C(74°F).

Table 4

Property	Test Method	Results
Humidity Resistance	100% humidity at 27°C(81°F) for 72 hours	No effect
Cold Resistance	72 hours at -56.6°C(-70°F)	No effect
Heat Resistance	72 hours at 71.1°C(160°F)	0.4 mm (1/64") maximum shrinkage from edge of panel
Adhesion	180° pullback at 30 cm (12") /minute at 23°C (74°F)	Minimum 2 kg/2.5 cm (4.4 ppi)
90° Peeling Test	0.8 kg (1.8lb) weight suspended for 5 minutes	3 mm (7/64") maximum peeling
Accelerated Weathering	Sunshine Weather-O-Meter for 2,000 hours	– No visible cracks, bubbles or puckering – Less than 0.2 mm (0.008") shrinkage – Reflectivity up to 50% greater than minimum required of all known specifications – No significant color changes
Salt Spray Effects	3% concentration at 35°C (95°F) for 500 hours	No effect

C. Resistance to Chemicals

Table 5

Property	Test Method	Results
Water	1 month	No effect
10% Hydrochloric Acid Solution	10 minutes	No effect
10% Sodium Chloride Solution	1 month	No effect
Methyl Alcohol	10 minutes	No effect
Kerosene	10 minutes	No effect
Turpentine	1 minute	No effect
Xylol	1 minute	No effect

6. DURABILITY

The most important properties of retroreflective sheeting are reflectivity, color, and durability. Of these, durability may be the most important, so special attention was directed toward the selection and use of raw materials and production technology that would render maximum durability. Continuous efforts are being made to attain even greater durability for all Nikkalite® products. From countless tests conducted, it has been determined that Nikkalite® EG applied as recommended can be expected to meet the durability standards given below without any clearcoating. Under certain weathering conditions, small hair cracks may appear in the sheeting, but such cracks do not significantly reduce the day or night performance of the signs.

Table 6

Type of Nikkalite®	Length of Durability
7112, 8112 (White)	7 years
7104, 8104 (Yellow)	7 years
7105/7135, 8105/8135 (Red)	6 years
7106, 8106 (Blue)	7 years
7107, 7177, 8107, 8177 (Orange)	6 years
7108, 8108 (Green)	7 years
7109, 8109 (Brown)	7 years

Note: The data above are based on the tests conducted in the United States as well as in Japan. These tests included outdoor exposure and Emmaqua* tests in Phoenix, Arizona, outdoor exposure in Miami, Florida, and Sunshine (carbon arc) weatherometer tests. It was found that durability is affected by the type of substrate, surface treatment of the substrate, exposure conditions, and types of maintenance.

* Emmaqua is an equatorial mount with mirrors for accelerated weathering, which includes the spraying at one hour intervals during daylight of distilled water on the test specimen. This type of test is conducted at DSET LABORATORIES, Inc. of Phoenix, Arizona, U.S.A.



Japan Weathering Center exposure site



Nikka Polymer Co., Ltd. exposure site

7. COLOR MATCHING

When it is necessary to use more than one sheet of Nikkalite® sheeting on one sign, it is recommended to use sheeting cut from the same roll. If, however, sheets from different rolls are used, care must be taken to ensure that the daytime and nighttime colors of the sheeting used are matched. Color matching should be done in daylight away from colored walls or other objects that can affect the color of the sheeting. To match night color, examine the sheeting in a dark room or area with a light directed on the surface. The light source (flashlight, spotlight, etc.) should be held at eye level and observation should take place from behind the light, as far away from the sheeting as practical.

8. APPLICATION

Nikkalite® is precoated with an adhesive that will bond the sheeting firmly and permanently to clean and smooth surfaces of tested and approved metal, coated metal, plastic, plywood, etc. Two application methods are employed to bond Nikkalite® sheeting to these surfaces: the vacuum-heat method and the pressure method.

A. Vacuum-Heat Application

Nikkalite® 7100 Series must be bonded to the sign substrate by means of the vacuum-heat application method.



B. Pressure Application

Nikkalite® 8100 Series is bonded to the sign substrate by application of pressure with a roller applicator or a squeegee. When applying Nikkalite® PS sheeting to large surface areas, the best results can be obtained by use of a mechanical roller applicator.



9. STORAGE AND SHELF LIFE

All Nikkalite® retroreflective sheeting must be stored in a cool, dry, and clean area. Avoid exposure to direct sunlight and storage in excessively humid areas. The shelf life of the sheeting is 12 months after delivery.

10. MAINTENANCE

Nikkalite® sheeting surfaces covered with dust or small particles of sand should be cleaned with water containing a mild, neutral cleaning solution. To avoid scarring the surface, use a soft, clean cloth or sponge when washing and drying.

To remove tar and oily substances, rub lightly with a soft cloth soaked with a mild solvent such as kerosene or turpentine.

All the aforementioned figures in the tables are based on our experience and actual measurements based on our own tests. However, these figures may not be guaranteed.

Reliability of Information

All recommendations and technical information contained herein are based on experieces and tests, which the manufacturer believes to be reliable; however, their accuracy and completeness are not warranted. The user is requested to conduct their own test/tests to determine the fitness of this product for the intended application.

Warranty

Nikkalite® Products are warranted to be free from defects in materials and workmanship at the time of their sale. except herein expressly warranted. NCI's (Nippon Carbide Industries Co., Inc.) liability is limited to replace the defective materials solely as stated herein. NCI shall not be liable for any loss, damage or injury, direct or indirect or incidental, arising from the use or inability to use said products, and the warranties of merchantability or fitness for a particular purpose as well.

Warning

Failure to comply with the explicit instructions in this bulletin will result in voiding all warranties express or implied for use of this product. If retroreflective sheeting is to be applied to a surface other than conventional sign blank materials, prospective users should contact technical representatives of Nippon Carbide Industries Co., Inc. for advice before such application.

Safety and Health Information

Read carefully in advance the labels, instruction manuals, material safety data sheets (MSDS), and first aid measures of the retroreflective sheetings supplied by Nippon Carbide Industries Co., Inc. (hereinafter referred to as "NCI"), the auxiliary materials such as inks and solvents used for NCI's products, and proprietarily used chemicals such as substrate cleansers.

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